



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION IX  
75 Hawthorne Street  
San Francisco, CA 94105

**MEMORANDUM**

**DATE:** SEP 15 2011

**SUBJECT:** Request for a Time-Critical Removal Action and for Exemption from \$2 Million and 12-Month Statutory Limits at the Haystack Navajo Radioactive Structures Site, New Mexico, Navajo Nation Indian Reservation

**FROM:** Will Duncan On-Scene Coordinator  
Emergency Response Section (SFD-9-2)

**THROUGH:** Harry L. Allen, Chief  
Emergency Response Section (SFD-9-2)

**TO:** Daniel Meer, Assistant Director  
Superfund Division (SFD-9)

**I. PURPOSE**

The purpose of this memorandum is to request and document approval to spend up to \$2,670,000 in direct extramural costs and to request an exemption from the \$2 million statutory cost limit and 12 month statutory time limit to mitigate threats to human health and the environment posed by the presence of hazardous substances at the Haystack Navajo Radioactive Structures Site (the Site). The Site is located within the Navajo Nation Indian Reservation and consists of 12 discrete structures and 8 residential properties situated within the Haystack and Church Rock Chapters, in McKinley County, New Mexico.

The memorandum would serve as approval for the expenditure required for U.S. EPA to take actions described herein to abate an imminent and substantial endangerment to residents of structures and allotments contaminated by hazardous substances. The proposed removal of hazardous substances would be undertaken pursuant to Section 104(a)(1) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C. § 9604(a)(1), and Section 300.415 of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR § 300.415. An exemption from the \$2 million statutory limit is justifiable under criteria of Section 104(c), 42 U.S.C. § 9604(c) and 40 C.F.R. § 300.4259b)(5)(i), which allows for an exemption from the statutory requirements when: there is an immediate risk to public health or welfare or the environment; continued response

actions are immediately required to prevent, limit, or mitigate an emergency; and such assistance will not otherwise be provided on a timely basis.

Conditions at the Haystack Navajo Radioactive Structures Site meet the criteria for the exemption from statutory limits, and if not addressed by implementing the immediate response action documented in this memorandum, may lead to additional human exposure to external gamma and alpha ionizing radiation, radon, radium-226 and uranium contamination.

A 12-month exemption is required due to the anticipated short construction season for 2011. Work is not expected to begin until November and severe cold weather during the late fall and winter is expected to impact accessibility to the allotments as well as the construction of replacement structure foundations. It is estimated that all twelve structure owners will opt for EPA to rebuild their structures. Although demolition activities are expected to be completed within the 12-month period, activities involved in replacing a structure have historically taken longer. This can be attributed to identifying and soliciting subcontractors, resident owner's individual preferences in replacement structure options, the remote location of each structure, and the coordination with Navajo Tribal Utility Authority (NTUA).

Likewise, the \$2 million exemption is required due to the cost of demolishing and disposing the structures as well as compensating the residents for the loss of their structures.

## **II. SITE CONDITIONS AND BACKGROUND**

Site Status: Non-NPL  
Category of Removal: Time-Critical  
CERCLIS ID: NNN000909132  
SITE ID: WW

### **A. Site Description**

#### **1. Physical Location**

The Site is located within the Navajo Nation Indian Reservation in New Mexico. The Site is situated within the Navajo Nation Chapters known as Haystack and Church Rock. See Figure 1 for a Site Location Map.

#### **2. Site Characteristics**

The Site consists of 12 structures and 8 exterior "hot-spots" on residential properties known as "Allotments." Allotments are reservation land the federal government distributed to individual Indians, generally in 40-, 80-, and 160-acre parcels. Typically, the allotment includes residential structures, Navajo ceremonial buildings,

called hogans, and frequently an outer storage building. The hogans and storage buildings are usually located in close proximity (within 200 feet) of the residential structures. Exterior surveys include approximately ½ an acre surrounding each primary structure; however, in some cases where the structures are closer together the survey areas may consist of less than ½ an acre apiece.

In February, June, July and August of 2011, U.S. EPA, in partnership with Navajo Nation EPA (NNEPA), investigated 58 residential properties containing 171 structures in the Haystack and Church Rock Chapter areas. U.S. EPA assistance was requested by the Navajo Nation to conduct these investigations based on results of initial screenings conducted by NNEPA in these same areas in 2009 and 2010. The U.S. EPA investigation identified 12 structures and 8 yards, all located within the Haystack and Church Rock Chapter areas, requiring response action. . All of the structures are occupied and used for residential purposes.

### **3. Removal site evaluation**

In February and throughout the summer of 2011, U.S. EPA conducted radiation assessments of 58 residential properties and all of the structures associated with each residential property, which amounted to a total of 171 structures. Most of the subject residential properties had been identified during previous screenings as potential concerns. These earlier screenings were conducted separately by NNEPA in order to streamline U.S. EPA's assessment activities.

Past and present investigations were requested based on anecdotal evidence that residents transported contaminated mine materials to their residential properties for use in structure construction. Many of these residents worked in nearby uranium mines and reportedly carried contaminated construction materials home from the mine.

In addition, some of the residential properties are situated downgradient from abandoned uranium mines (both reclaimed and un-reclaimed). Therefore, some of the contamination in residential soils may be the result of contaminant transport forces (*i.e.*, contaminant migration due to wind and runoff).

U.S. EPA conducted the radiological assessments of these 171 structures in partnership with NNEPA. In each structure, U.S. EPA measured total gamma radiation and gamma radiation dose rate. NNEPA measured total radon in select rooms in structures where there were current residents. Outside of each structure on the residential property yard, U.S. EPA measured total gamma radiation using a GPS integrated radiation ratemeter. The equipment logged the GPS location for each reading, collecting thousands of mapped data points per residential property.

Inside each structure and in every room, U.S. EPA conducted gross gamma scanning surveys of structure floors and walls with a ratemeter and a Ludlum Model 44-20 (a 3" by 3" unshielded sodium iodide scintillator). In those same locations U.S. EPA

conducted an area gross gamma dose rate measurement with a Reuter-Stokes RSS-131 Pressurized Ionization Chamber (PIC). Finally, radon measurements were collected using Rad Elec model radon detection equipment. Results from all instruments at all locations were tabulated for use in removal decision-making in consultation with NNEPA.

Daily background PIC and ratemeter measurements were also included in the tables. These background measurements were collected at a field calibration site visually determined to be uncontaminated by the assessment team. The average background measurements were used to determine daily instrument investigation levels (ILs) (Average background plus 3 times the standard deviation). Areas exceeding ILs for any of the instruments were flagged and photographed by the assessment team during each residential property and structure investigation.

Based on the assessment results, U.S. EPA determined that twelve structures in the Haystack and Church Rock Chapter area require a removal action. These structures are identified as EPA Structure ID Nos: BH-002A, BH-005A, BH-007A, BH-007B, BH-19D, BH-026A, BH-034H, BH-036A, BH-38C, BH-42A, BH-42B, and CR-081A. At nine of these structures, the indoor dose levels collected with the PIC exceed the dose action level. At the remaining three structures, the indoor dose does not exceed the action level; however, high levels of gamma radiation measured by other instruments as well as elevated interior radon levels indicate the need for removal of all or part of the structure. All twelve structures are located within the Navajo Nation boundary.

U.S. EPA also determined that eight yards in the Haystack and Church Rock Chapter areas require a removal action. The eight yards are identified as EPA Site ID Nos: BH-016, BH-026, BH-029, BH-035, BH-038, BH-040, BH-042, and CR-092. Each of these residential properties has a "hotspot" which is above the action level of two times background.

#### **4. Release or threatened release into the environment of a hazardous substance, or pollutant or contaminant**

##### *Inside of Structures*

Based on U.S. EPA's 2011 assessments, building materials at nine structures are emitting gamma radiation at doses greater than the Site-specific dose action level. An additional three structures do not exceed the Site-specific dose action level but have consistent elevated radiation activity measurements greater than the IL within the structure as well as elevated radon measurements. Gamma radiation from the structures may be indicative of uranium contaminated building materials. While uranium itself is not highly radioactive, due to its long radioactive half-life, its progeny do release high levels of gamma radiation. These progeny products, including radium, thorium,

etc. are co-located with uranium because they are formed as the uranium undergoes its radioactive decay process.

As discussed above, U.S. EPA collected dose measurements using the PIC in every room of every structure within the assessment. U.S. EPA also determined daily background dose measurements using the PIC at pre-determined background locations within the Haystack and Church Rock Chapters. U.S. EPA calculated annual doses (based on fixed assumptions) using both structure dose and background dose measurements. These annual doses were compared to determine if the structure dose exceeded the background dose by at least 15 millirem (mrem)/year. This action level represented an amount of radiation as a dose that was distinguishable from background gamma radiation measurements and concomitant cancer risk due to exposure to external gamma radiation. Selected results are provided in Attachment II, Tables 1 and 2.

At three structures the dose did not exceed the action level; however, U.S. EPA determined that radiation measurements in parts of the structures were above the Investigation Level. In such situations, U.S. EPA plans to conduct a second area gross gamma dose rate measurement with the PIC in every room of structures requiring additional assessment to determine if derived annual doses exceed the dose action level. If dose readings in these structures exceed the level then all or part of these structures will be demolished and replaced.

#### *Outside of Structures*

U.S. EPA identified eight areas on eight residential properties which exceed the action level. Two of these residential properties also have contaminated structures. The other six do not.

### **5. NPL status**

The Haystack Navajo Radioactive Structures Site is not on the National Priorities List (NPL). Current conditions at the Site pose an imminent and substantial endangerment (see Sections III and IV) at these 12 residential structures and eight residential yards. The proposed Removal Action will complete all work at the Haystack Navajo Radioactive Structures Site but will not complete work at other potential Sites, which may include additional structures in other regional areas and nearby Abandoned Uranium Mines (AUMs).

#### **B. Other Actions to Date**

No other response actions have occurred at the Site to date.

#### **C. State and Local Authorities' Roles**

## **1. State and local actions to date**

No State or Tribal actions have taken place at the Site. Formal consultations with the Navajo Nation for a broad range of AUM-related issues have been ongoing for several years, and formal consultations for this removal action began in late 2009. NNEPA is closely involved in the planning and execution of this removal action. These discussions satisfy the regulatory requirement of State and Tribal referral.

## **III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES**

Current Site conditions pose ongoing releases and the threat of future releases of hazardous substances, namely: uranium and its progeny (*i.e.*, radium-226 and radon) and ionizing gamma and alpha radiation associated with those progeny. The likelihood of direct human exposure, via ingestion and/or inhalation of hazardous substances, and the threat of future releases and migration of those substances, pose an imminent and substantial endangerment to public health, welfare, and the environment based on the factors set forth in the NCP, 40 CFR § 300.415(b)(2). These factors include:

### **1. Actual or potential exposure to hazardous substances or pollutants or contaminants by nearby populations or the food chain**

As described in Section II.A.4, elevated levels of ionizing gamma radiation have been detected in residential structures and in soils of residential properties. U.S. EPA has determined that full-time occupants of the structures are exposed to gamma radiation and, in some cases, radon, at levels greater than background levels and regulatory thresholds. These exposures pose an excess cancer risk above the background risk. Additionally, persons exposed to excess levels of external gamma radiation in outdoor, residential soils may also face excess cancer risk. Furthermore, elevated levels of gamma radiation in external soils, resulting from uranium mine waste contamination, are indicative of the presence of radium which poses additional health risks related to alpha ionizing radiation exposures.

In interviews with residents of these properties, we learned that structures that are not currently being used as residences have, in many cases, been occupied in the past, or may be occupied as residences in the future. There is little practical distinction among the Navajo between structures ostensibly built for residence versus those built for storage and ceremony. Therefore we have concluded that all structures with dimensions greater than or equal to 8 feet in length by 8 feet in width should be considered potential residences and subject to the same action levels.

Ionizing radiation is comprised of particles and rays given off by radioactive material. These include alpha particles, beta particles, x rays, and gamma rays. Ionizing radioactive particles and rays knock electrons from atoms and molecules (such as water, protein, and DNA) that they hit or pass by. There are myriad sources of low



level ionizing radiation including the sun, rocks, soil, natural sources in the body, as well as human made sources. For example, additional exposures accompany each x ray exam. Background level exposure to environmental ionizing radiation has not been shown to affect the health of children or adults. Exposure to greater than background levels of gamma ionizing radiation may increase the chance of getting cancer depending on a person's level of exposure (ATSDR 1999b).

Exposure to high doses of ionizing radiation can result in skin burns, radiation sickness, and death. If a pregnant woman is exposed to high levels of ionizing radiation, it is possible that her child may be born with some brain abnormalities. As levels of ionizing radiation increase, so does the chance of brain abnormalities in the developing fetus (ATSDR 1999b).

NNEPA and U.S. EPA measured radon and ionizing gamma radiation. Ionizing radiation was measured using 2 different metrics, total activity and dose or exposure rate. U.S. EPA measured ionizing radiation as a means of detecting contamination from outside sources in the structures and yards. Ionizing radiation poses health risks in and of itself, as discussed, but also is an indicator of the presence of more harmful uranium progeny and ultimately of uranium itself.

According to U.S. EPA guidance, 15 mrem/yr dose rate of ionizing gamma radiation represents an excess cancer risk of  $3 \times 10^{-4}$  above background. The risk calculation in this case utilizes a 30-year exposure period per lifetime and a 24 hour/day exposure rate. The risk calculation is based upon a risk conversion factor of 7% cancer incidence per 100 rem of exposure and comes from the National Academy of Sciences report on the Biological Effects of Ionizing Radiation (BEIR V). Persons occupying structures exceeding the action level are being exposed to releases of external gamma radiation at levels that pose cancer risks of greater than  $3 \times 10^{-4}$ .

The U.S. EPA has set a guideline for radon in air inside homes of 4 picocuries per liter (4 pCi/L) of air. Persons exposed to radon concentrations greater than 4 pCi/L also face increased cancer risks. Radon is a naturally occurring radioactive gas that is formed from the radioactive decay of uranium. Indoor radon levels are affected by the radium and uranium levels in soil, the porosity of the soil, the composition and condition of the foundation materials, and the ventilation rate of the room. People exposed to high levels of radon have an increased incidence of lung cancer (ATSDR 1999b). U.S. EPA's use of area-specific background levels is intended to verify that removal actions are taken in response to mine-related releases of radiation, rather than naturally-occurring radiation in area soils.

Uranium is found in small amounts in most rocks and soil. It slowly breaks down to its progeny including radium and radon. Radium and radon enter the environment from the soil, and from uranium mines and sometimes other types of mines. Uranium

occurring in a subsurface vein is brought to the surface during mining activities. Thorium is also often present in uranium ore.

One of the radioactive properties of uranium is its half-life, or the time it takes for half of the isotope to give off its radiation and change into another substance. The half-lives are very long (between 200,000 years and 5 billion years). This is why uranium still exists in nature and has not all decayed away and does not itself emit high levels of ionizing radiation. Inhalation and ingestion of uranium can result in kidney damage. The radiation damage from exposure to high levels of natural uranium is not known to cause cancer (ATSDR 1999c).

Radium is formed when uranium and thorium break down in the environment. Two of the main radium isotopes found in the environment are radium-226 and radium-228. During the decay process, alpha, beta, and gamma radiation are released. Radium may be found in air and water. Radium in the soil may be absorbed by plants.

Acute inhalation exposure to high levels of radium can cause adverse effects to the blood (anemia) and eyes (cataracts). It also has been shown to affect the teeth, causing an increase in broken teeth and cavities. Exposure to high levels of radium results in an increased incidence of bone, liver, and breast cancer. The BEIR V report has also stated that radium is a known human carcinogen (ATSDR, 1999a). Inhalation of radium contaminated particulates is of particular concern. Radium emits alpha radiation, which, when inhaled, becomes a source of ionizing radiation in the lung and throat, possibly leading to toxic effects.

The contaminated yards at the Haystack Navajo Radioactive Structures Site are likely to result in human exposure via inhalation or ingestion. Contamination is readily accessible to on-site full-time residents and potentially nearby part-time and/or full-time residents. Persons occupying or traversing the Site may be exposed to contaminated dust by inhalation or ingestion of contamination sorbed to particulate matter. Incidences of direct contact with natural and mechanically generated dust during these activities account for known contamination exposure scenarios faced at the Site. Uranium and radium-226 may be entrained in naturally and mechanically generated dust and/or transported on shoes and clothing of residents passing over contaminated areas. Gardening and other yard work also may result in exposure to contamination.

Children may ingest contaminants during play activities in contaminated yards.

## **2. High levels of hazardous substances in soils at or near the surface that may migrate**

Contamination in yards may migrate off-site via wind and water transport mechanisms including mechanical dust generation. It is likely that this contamination could continue to migrate beyond the residential properties comprising the Haystack Navajo Radioactive Structures Site boundary. Some of the radium daughter particles,



such as radon, also have a specific tendency to adhere to dust particles and migrate and may have traveled off-site in historic surface water flows.

**3. Weather conditions that may cause hazardous substances to migrate or be released**

Rainfall events may lead to transport of the contamination from the residential properties. High soil erosion rates may indicate transport of contamination from the residential properties constituting a release of hazardous substances and resulting in secondary contamination sources. In addition, contaminants may migrate during high wind events due to the propensity for contaminants to adhere to windborne dust particles.

**4. Availability of other appropriate federal or state response mechanisms to respond to the release**

NNEPA has informed U.S. EPA that it does not have the resources to address the Site. Further, the NNEPA has sent a formal request to U.S. EPA requesting that U.S. EPA address this area through a Time-Critical Removal Action.

**IV. ENDANGERMENT DETERMINATION**

Actual and threatened releases of hazardous substances from the Haystack Navajo Radioactive Structures Site, if not addressed by implementing a Time-Critical Removal Action, may continue to present an imminent and substantial endangerment to public health, or welfare, or the environment.

**V. EXEMPTION FROM STATUTORY LIMITS**

Removal activities at other Navajo Radioactive Structure Removal sites began in August 2009. Based on past experience with replacing structures in the Navajo Nation Indian Reservation, EPA anticipates that the removal action will take approximately 18 months to complete, which is longer than the 12-month statutory limit. Similarly, based on EPA's experience compensating structure owners, EPA is requesting \$2,670,000 in direct extramural cleanup costs, which is above the \$2 million statutory limit. Subject to exceptions, 42 U.S.C. § 9604(c)(1) states that removal actions should not continue after \$2 million has been obligated for response actions or 12 months has elapsed from the date of initial on-site response. Pursuant to EPA delegations 14-2 and R9 1290.03A, the Assistant Director to the Superfund Division is authorized to determine whether an exception from this statutory limitation is warranted. EPA Region 9 believes that, consistent with the standards for exception stated in 42 U.S.C. § 9604(c)(1)(A) and 40 C.F.R. § 300.415(b)(5), an exception to the cost and time limits for removal actions is warranted for the following reasons:

**1. There is an immediate risk to public health or welfare or the environment**

Persons occupying contaminated structures on a full-time or part-time basis are at risk of exposure to external gamma and alpha ionizing radiation, radon, radium-226 and uranium contamination. Exposures to alpha ionizing radiation due to the presence of radium-226 and radon pose an increased risk of toxic effects including cancer. See Section III.1 for more information and other health risks related to exposures to these hazardous substances.

**2. Continued response actions are immediately required to prevent, limit or mitigate an emergency**

Based on results of previous radiological assessments, U.S. EPA has already mitigated exposures due to radiological contamination in 34 structures in six other Navajo Nation Chapters. During those efforts, EPA moved several residents into temporary housing or lodging in order to carry out demolition activities. All of these structures were similarly contaminated with uranium and its daughter products, notably radium-226 and radon. Continued response actions are required to mitigate avoidable exposures to these hazardous substances in the structures addressed in this memorandum.

**3. Assistance will not otherwise be provided on a timely basis**

NNEPA does not have the capabilities or resources to carry out this effort in a timely manner. If EPA does not begin the proposed removal action immediately, the residents' risk of exposure to radiological contamination will continue unabated. Moreover, if the government delays approval of this removal action and rebuilding of replacement structures, EPA will incur additional costs for extended temporary relocation benefits for displaced residents and temporary storage of personal property from the demolished structures due to the short construction season (i.e., removal costs will likely increase if EPA is unable to timely complete its demolition and exterior construction efforts before the late Fall of 2011, when weather conditions effectively prevent access to sites by cement and delivery trucks).

**VI. PROPOSED ACTIONS AND ESTIMATED COSTS**

**A. Proposed Actions**

**1. Proposed action description**

U.S. EPA proposes to mitigate the imminent and substantial threats to human health, welfare, or the environment by taking steps to prevent the release of radium-226, uranium, and external gamma radiation. The removal action will include the following objectives to prevent direct human contact with external alpha and gamma

radiation as well as uranium and its progeny radium-226 and radon from building materials and in residential soils at 12 properties:

- Remove portions of or the entirety of 12 contaminated structures.
- Remove contaminated soil or material from eight residential properties.
- Transport and dispose excavated material at an appropriate facility. The facility will be determined by U.S. EPA in consultation with NNEPA.
- Replace excavated soils with clean fill and restore property to pre-removal conditions by replacing fences, trees and shrubs if necessary.
- Compensate demolished structure owners by either providing a comparable replacement structure or appropriate financial compensation consistent with EPA guidance and the Uniform Relocation Act. .
- Conduct confirmation scanning, sampling and analysis.
- Requested funding also will include payment for voluntary temporary lodging for families of affected residential properties consistent with EPA temporary relocation guidance.

Demolition and reconstruction of contaminated structures will achieve the goal of reducing the external gamma radiation dose to less than 15 mrem/year above background. Demolition and removal of some or all of the structures that exceed ILs will also serve to bring radiation down to levels below ILs. Excavation and removal of contaminated walls will achieve the ultimate goal of reducing the radium concentration in the excavation footprint to a concentration that is within the acceptable risk range.

## **2. Contribution to remedial performance**

This removal action would complete all clean-up activities at the Haystack Navajo Radioactive Structures Site.

### The long-term cleanup plan for the site:

It is expected that this removal action will eliminate any threat of direct or indirect contact with or inhalation of hazardous substances at these residential properties. As discussed below, U.S. EPA expects to conduct subsequent assessments of other structures and AUMs located throughout the Navajo Nation to determine what additional response actions may be necessary.

### Threats that will require attention prior to the start of a long-term cleanup:

U.S. EPA has identified imminent threats posed by external gamma and alpha ionizing radiation, radon, radium-226 and uranium contamination at the Haystack Navajo Radioactive Structures Site. The mitigation actions described above will constitute a permanent remedy for the Site.

Sources of the contamination may require long-term cleanup. In future actions, these sources may include individual Navajo AUM site cleanups. U.S. EPA will continue to coordinate with NNEPA to evaluate the risk of human health effects based on mine wastes exposure pathways that may be present at these other AUM sites.

The extent to which the removal will ensure that threats are adequately abated:

The removal of surficial hazardous substances contamination by structure demolition, and soil and/or material excavation and disposal will abate the threats described in Section III.

Consistency with the long-term remedy:

The Time-Critical Removal proposed for the Site is consistent with addressing the larger issue of potential exposures posed by other AUM sites.

### **3. Applicable or relevant and appropriate requirements (ARARs)**

Section 300.415(j) of the NCP provides that removal actions must attain ARARs to the extent practicable, considering the exigencies of the situation.

Section 300.5 of the NCP defines applicable requirements as cleanup standards, standards of control, and other substantive environmental protection requirements, criteria or limitations promulgated under Federal environmental or State environmental or facility citing laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location or other circumstances at a CERCLA site.

Section 300.5 of the NCP defines relevant and appropriate requirements as cleanup standards, standards of control and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility citing laws that, while not “applicable” to a hazardous substance, pollutant, or contaminant, remedial action, location, or other circumstances at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site and are well-suited to the particular site.

Because CERCLA on-site response actions do not require permitting, only substantive requirements are considered as possible ARARs. Administrative requirements such as approval of, or consultation with administrative bodies, issuance of permits, documentation, reporting, record keeping and enforcement are not ARARs for the CERCLA actions confined to the site.

Federal ARARs determined to be practicable for the Site are:

- U.S. Department of Transportation of Hazardous Materials Regulations 49 CFR Part 171, 172 and 173.

- Uranium Mill Tailings Radiation Control Act (40 CFR Part 192.12 subparts B and C) requirements for residential cleanup levels of tailings sands.
- Native American Graves Protection and Repatriation Act, 25 USC Section 3001 *et seq.* and its implementing regulations, 43 CFR Part 10.
- National Historic Preservation Act, 16 USC Section 470 *et seq.* and its implementing regulations, 36 CFR Part 800.
- Archeological Resources Protection Act of 1979, 16 USC Section 47000 *et seq.* and its implementing regulations, 43 CFR Part 7
- American Indian Religious Freedom Act, 42 USC Section 1996 *et seq.*

Additional Federal guidance to be considered:

- U.S. EPA Directive on Protective Cleanup Levels for Radioactive Contamination at CERCLA sites. OSWER Directive 9200.4-18.

#### **4. Project schedule**

It is estimated that it will take approximately 45 working days to complete excavation and transport to a temporary staging area. Permanent disposal will continue beyond 45 days to no more than 90 days. EPA estimates that it will take 18 months to compensate residents of demolished structures either through provision of replacement structures or financial reimbursement.

#### **B. Estimated Costs**

##### Regional Removal Allowance Costs

Cleanup Contractor	\$ 1,700,000
USCG PST	\$ 20,000
Structure Compensation	\$ 200,000
USACE IAG	\$ 650,000

##### Extramural Costs Not Funded from the Regional Allowance

START Contractor	\$ <u>100,000</u>
Extramural Subtotal	\$ 2,670,000

TOTAL, Removal Action Project Ceiling \$ 2,670,000

#### **VII. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN**

Given the Site conditions, the nature of the hazardous substances documented on-site, and the potential exposure pathways to nearby populations described in



Sections III and IV above, actual or threatened releases of hazardous substances from the Site, if not addressed by implementing the response actions selected in this Action Memorandum, may present an imminent and substantial endangerment to public health, or welfare, or the environment.

## **VIII. OUTSTANDING POLICY ISSUES**

There are no outstanding policy issues with the Site identified at this time.

## **IX. ENFORCEMENT**

Please see the attached Confidential Enforcement Addendum for a discussion regarding potentially responsible parties (PRPs). The following intramural costs are also recoverable:

### Intramural Costs<sup>1</sup>

U.S. EPA Direct Costs	\$ 200,000
U.S. EPA Indirect Costs (45.07%)	<u>\$ 1,293,509</u>
TOTAL Intramural Costs	\$ 1,493,509

The total U.S. EPA extramural and intramural costs for this removal action, based on full-cost accounting practices that will be eligible for cost recovery are estimated to be \$4,163,509.

## **IX. U.S. EPA RECOMMENDATION**


This decision document represents the selected removal action for the Haystack Navajo Radioactive Structures Site, McKinley County, New Mexico developed in accordance with CERCLA as amended, and not inconsistent with the NCP. This decision is based on the Administrative Record for the Site.

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<sup>1</sup> Direct costs include direct extramural costs and direct intramural costs. Indirect costs are calculated based on an estimated indirect cost rate expressed as a percentage of site-specific direct costs, consistent with the full cost accounting methodology effective October 2, 2000. These estimates do not include pre-judgment interest, do not take into account other enforcement costs, including Department of Justice costs, and may be adjusted during the course of a removal action. The estimates are for illustrative purposes only and their use is not intended to create any rights for responsible parties. Neither the lack of a total cost estimate nor deviation of actual costs from this estimate will affect the United States' right to cost recovery.

Because conditions at the Site meet the NCP Section 300.415(b) criteria for a removal and the CERCLA Section 104(c) emergency exemption from the \$2 million and 12-month statutory limitations. EPA enforcement staff recommends the approval of the removal action proposed in this Action Memorandum. The total project ceiling if approved will be \$2,670,000 of which an estimated \$2,670,000 comes from the Regional Removal Allowance. Approval may be indicated by signing below.

Approve:



Daniel Meer, Assistant Director  
Superfund Division

Date

15 September 2011

Disapprove:

Daniel Meer, Assistant Director  
Superfund Division

Date

Figure 1: Site Location Map – Baca-Haystack

Figure 2: Site Location Map – Church Rock

Enforcement Addendum

Attachments:

- I. Index to the Administrative Record
- II. Results Tables 1 and 2 for Selected Residential Properties Haystack Navajo  
Radioactive Structures Site
- III. List Of Hot Spots From Exterior Survey Field Sheet

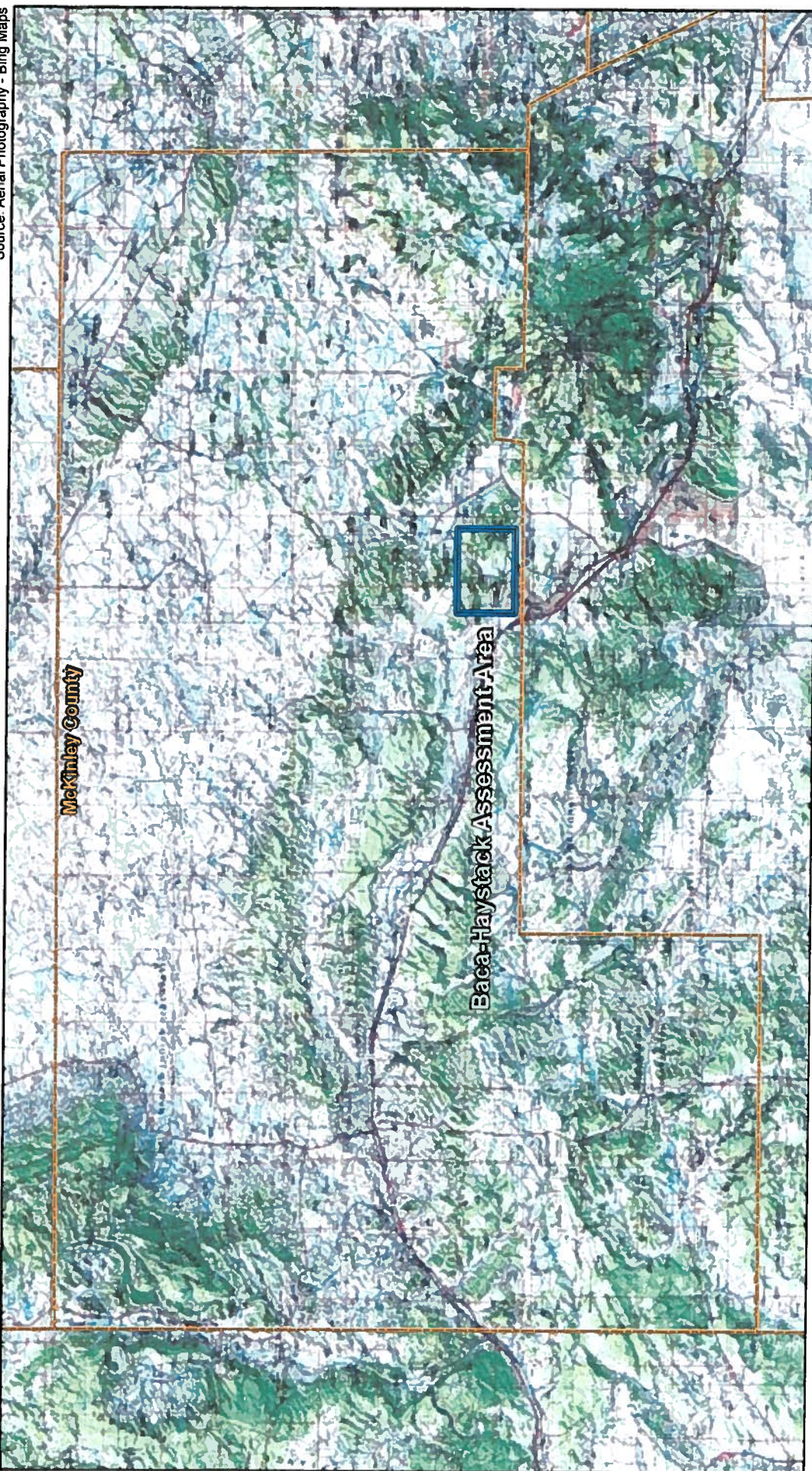
cc: David Chung, U.S. EPA, OERR, HQ  
Steven Etsitty, Navajo Nation Environmental Protection Agency  
David Taylor, Navajo Nation Department of Justice  
Steven Spencer, U.S. Department of Interior  
Ron Maldonado, Navajo Nation Historic Preservation Dep't



bcc: H. Allen, SFD-9-2  
W. Duncan, SFD-9-2  
H. Karr, ORC-3  
S. Goldsmith, ORC-3  
C. Temple, SFD-9-2  
Site File







**LEGEND**



County boundary

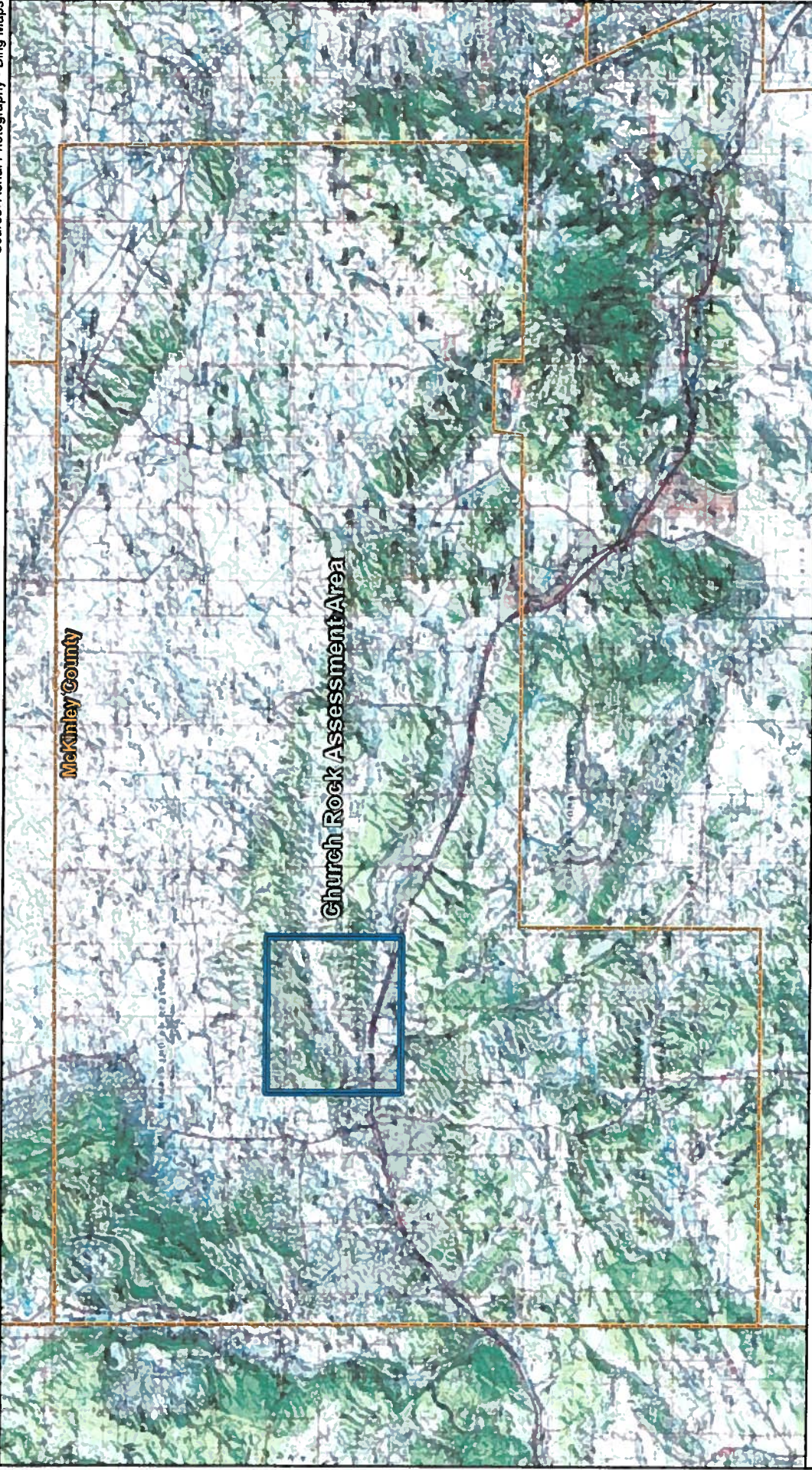


**Figure 1**  
**Site Location Map**  
**Baca-Haystack**  
**Site Assessment Area**  
McKinley County, New Mexico










**LEGEND**

 County boundary



0 15 30 Miles

**Figure 2**  
**Site Location Map**  
**Church Rock**  
**Site Assessment Area**  
McKinley County, New Mexico





**ATTACHMENT I**  
**INDEX TO THE ADMINISTRATIVE RECORD**

1. Agency for Toxic Substances and Disease Registry (ATSDR) ToxFAQs, Radium CAS#7440-14-4. ATSDR. July 1999a.
2. Agency for Toxic Substances and Disease Registry (ATSDR) ToxFAQs, Radon CAS#14859-67-7. ATSDR. September 1999b.
3. Agency for Toxic Substances and Disease Registry (ATSDR) ToxFAQs, Ionizing Radiation. ATSDR. September 1999c.
4. Agency for Toxic Substances and Disease Registry (ATSDR) ToxFAQs, Uranium CAS#7440-61-1. ATSDR. September 1999d.





**ATTACHMENT II**  
**RESULTS TABLES 1 and 2 FOR SELECTED HOMESITES**  
**HAYSTACK NAVAJO RADIOACTIVE STRUCTURES SITE**



**RISK ASSESSMENT CALCULATIONS TABLE 1**  
**Haystack and Church Rock Chapter, Navajo Nation**

Monitoring Information							Background and Dose Summary			
Location	Room	Date	Measurement	Units	Instrument Type	Instrument-specific Daily Background	Total Annual Dose (mrem/yr)	Background Annual Dose (mrem/yr)	Difference (mrem/yr)	
BH-002-A	LR/BR	07/12/11	16.14	μR/hr	PIC	12.9	141.5	113.1	28.4	
BH-005-A	LR	02/14/11	17.19	μR/hr	PIC	12.97	150.7	113.7	37.0	
BH-005-A	KIT	02/14/11	18.18	μR/hr	PIC	12.97	159.4	113.7	45.7	
BH-007-A	LR/BR	02/15/11	14.72	μR/hr	PIC	12.94	129.0	113.4	15.6	
BH-007-D	SR	02/15/11	15.46	μR/hr	PIC	12.94	135.5	113.4	22.1	
BH-026-A	LRa	08/26/11	15.35	μR/hr	PIC	12.54	134.6	109.9	24.6	
BH-026-A	LRb	08/26/11	14.42	μR/hr	PIC	12.54	126.4	109.9	16.5	
BH-026-A	KIT	08/26/11	14.61	μR/hr	PIC	12.54	128.1	109.9	18.1	
BH-034-H	KIT	08/24/11	14.90	μR/hr	PIC	13.00	130.6	114.0	16.7	

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Monitoring Information						Background and Dose Summary				
Location	Room	Date	Measurement	Units	Instrument Type	Instrument-specific Daily Background	Total Annual Dose (mrem/yr)	Background Annual Dose (mrem/yr)	Difference (mrem/yr)	
BH-036-A	LRA	08/23/11	15.08	μR/hr	PIC	13.29	132.2	116.5	15.7	
BH-036-A	DRa	08/23/11	16.00	μR/hr	PIC	13.29	140.3	116.5	23.8	
BH-042-B	SR1	08/25/11	16.73	μR/hr	PIC	12.66	146.7	111.0	35.7	
BH-042-B	SR2	08/25/11	20.44	μR/hr	PIC	12.66	179.2	111.0	68.2	
BH-042-B	SR3	08/25/11	17.19	μR/hr	PIC	12.66	150.7	111.0	39.7	
CR-081-A	KIT	08/27/11	15.62	μR/hr	PIC	12.28	136.9	107.6	29.3	
CR-081-A	BR1	08/27/11	15.36	μR/hr	PIC	12.28	134.6	107.6	27.0	
CR-081-A	BR2	08/27/11	15.97	μR/hr	PIC	12.28	140.0	107.6	32.3	
CR-081-A	BR3	08/27/11	14.60	μR/hr	PIC	12.28	128.0	107.6	20.3	
CR-081-A	LR	08/27/11	15.68	μR/hr	PIC	12.28	137.5	107.6	29.8	
CR-081-A	BATH	08/27/11	14.33	μR/hr	PIC	12.28	126.5	107.6	18.0	



**GAMMA AND RADON MEASUREMENTS TABLE 2**  
**Haystack and Church Rock Chapter, Navajo Nation**

Location	Room	Date	Background	Units	Instrument Type	Investigation / Action Level	Measurement	
							Gamma	Radon
BH-019-D	SR	07/11/11	18,711	CPM	Ratemeter with 3x3 detector	25,501	45,000	NA
BH-019-D			NA	pCi/L	Rad Elec	4.0	NA	Pending
BH-038-C	BATH	08/25/11	19,844	CPM	Ratemeter with 3x3 detector	32,344	40,000	NA
BH-038-C			NA	pCi/L	Rad Elec	4.0	NA	Pending
BH-042-A	KIT1	08/24/11	14,164	CPM	Ratemeter with 3x3 detector	21,284	35,000	NA
BH-042-A			NA	pCi/L	Rad Elec	4.0	NA	Pending



**ATTACHMENT III**  
**LIST OF HOT SPOTS FROM EXTERIOR SURVEY FIELD SHEET**



## **List of Hot Spots from Exterior Survey Field Sheet**

BH 35 – Hot spot east of structure A (240K)

BH 16 – Foundation hot spot on south wall of living room (51K), second foundation hot spot on west wall of kitchen (171K), three rocks under tree in front of house (90-145K)

BH 40 – 4 inch hot rock (140K), 8inch hot rock (360K), area northwest of structure D with scattered hotspots on rocks (175K)

BH 29 – cinderblock fence behind house (25K), hot spot on SE corner of church foundation (60K), hot rock under fence line SE of church (205K), 10ft x 10ft dirt area in front of church (700K), 3ft x 6ft dirt area in front of church (900K), two hot spots on edge of gully along road (112K and 250K)

BH 38 – Hot spot on SE foundation of structure B (285K), surface of flagstones on southeast of structure C is generally 50-100K with two hot spots (226K and 280K), two hot rocks around tree in southeast corner of structure C (94K, 110K), interior hot spots in structure C bedroom 1 (50K, 60K, 65K), 4 foot diameter rock pile southwest of structure L (28K-34K with one rock at 600K).

BH 42 – old mine ventilation shaft in front yard/drive east of structure A was filled with debris by owner (35-87K), large petrified wood tree trunk on southeast wall of structure A (37K), hot rock in front of structure B (999K), two piles of rocks south of structure D (200K), three hot spots on exterior foundation of south and west walls of structure B (156K, 123K, and 117K), rocks in front of structure D (60K), rock to southwest of structure I

BH-26A – Front cement patio to front door up to 160K.

CR-92 – An 8'x8' area northeast of CR92A that had readings up to 103K.



